

# MASS STORAGE **for Xilinx FPGA Configuration**

***The Configurator is a micro-controller with Flash memory, allowing configuration of up to eight FPGAs in parallel.***

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The Configurator from Configurator, Inc., shown in Figure 1, provides a large FLASH memory to store configurations for all of the Xilinx FPGAs. It also includes an intelligent link to your PC along with control software, so you get enough storage space for multiple devices and multiple configurations with fast and easy file management.

The Configurator supports all XC3000, XC4000, XC5000, Spartan, and Virtex devices with 8-, 16-, and 32-Megabit models available. The Configurator is programmable in-system using a Windows application program communicating over a 115k Baud serial port connection. It's available now in a 32-pin DIP package for easy integration into circuit card designs.

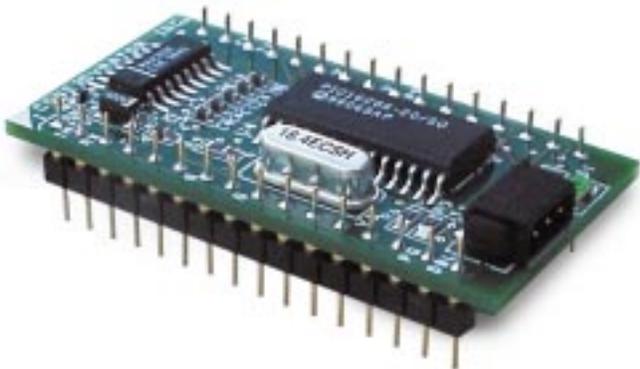


Figure 1 - Configurator 32-pin DIP module.

## Memory Allocation

The Configurator allocates each output of the FLASH memory to a Xilinx FPGA, permitting up to eight FPGAs to be configured at once. If fewer than eight FPGAs are to be configured, the Configurator will automatically use more than one data bit for storage for each FPGA, thereby increasing the bitstream file storage space available.

The selection of a Configurator model's flash memory size is based on the number of FPGAs to be configured and the size of each FPGAs bitstream file. For example, a Configurator-8M (8 megabits) can configure up to eight FPGAs with each one having a maximum bitstream file length of less than one megabit. However the same Configurator-8M will automatically interleave bits of data so that if only four FPGAs need to be configured on the card, the maximum bitstream file length is increased to two megabits each.

Table 1 illustrates a subset of the storage capabilities provided by a single Configurator. To use this table:

1. In the left hand column select the largest FPGA you will be configuring.
2. Go right across the top selecting the number of FPGAs and the number of configuration planes.

- Where row and column intersect is the Configurator model you will need. If you have an odd number of FPGAs to configure or an odd number of configuration planes round up to the next power of two.

For example, if you have four FPGAs to configure, the largest of which is a Virtex XCV50, and you want three different configuration planes, go down the left side until you get to the XCV50 row then across to the "4 FPGAs/ 4 planes" column indicating that a Configurator-8M would satisfy your requirements.

## Configuration Control

The Configurator adds on-board configuration control to FPGA designs by providing the capability to store custom configuration information in the flash memory. The date, path, and filename are stored automatically and user information such as design version, firmware numbers, and so on, may be stored with each bitstream file and are user configurable. This configuration information is especially helpful during FPGA development to identify revisions of bitstream files.

The Configurator also minimizes field upgrade costs by providing in-system re-programmability, a simple RS-232 serial port interface, and configuration information to help field service personnel determine and update the required bitstream file changes.

## Internet Reconfigurable Logic

The Windows GUI communicates with the Configurator module using ASCII character protocols providing an easy method of performing remote bitstream file updates. The formatted bitstream files are also text files that are easily distributed. The communication link could be an Internet connection permitting hardware updates from anywhere in the world.

## Windows User Interface

The Configurator Windows GUI as shown in

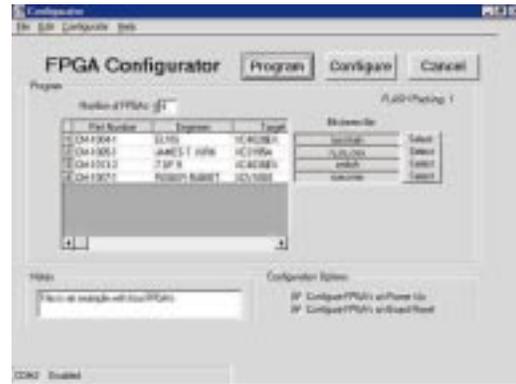


Figure 2 - Windows configurator user interface.

Figure 2 runs on Windows 95/98/NT systems and provides an easy interface to the Configurator. To download new bitstream files to the Configurator, connect to a serial port, select the .bit files, then select "Program." The GUI will download the configuration files at 115K bits per second, saving the data to FLASH memory. For example, if an additional signal probe is needed during debugging, the power may be turned off, the probe attached, and when the power is turned back on the Configurator module will re-configure the FPGAs without the need for another download.

## Re-configurable Computing Applications

The Configurator has the ability to store configuration files in up to eight different planes. Each plane can have one configuration file for up to eight FPGAs. The planes are selectable from the host card's hardware to support re-configurable logic applications. This feature permits multiple

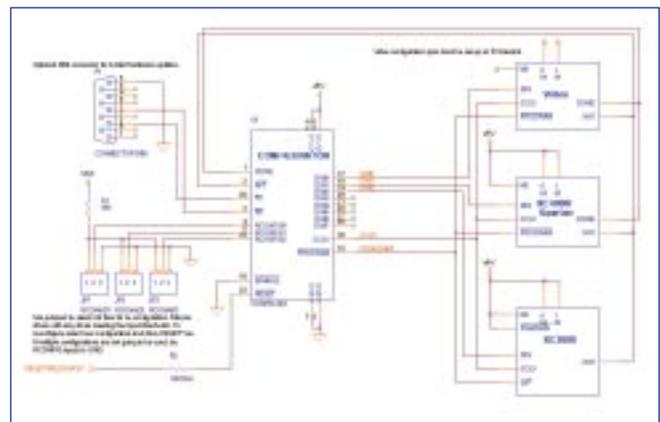


Figure 3 - Configurator example schematic.

FPGA PART NUMBER	CONFIGURATION BITS REQUIRED	8 FPGA'S				4 FPGA'S				2 FPGA'S				1 FPGA			
		8 PLAINES	4 PLAINES	2 PLAINES	1 PLAINES	8 PLAINES	4 PLAINES	2 PLAINES	1 PLAINES	8 PLAINES	4 PLAINES	2 PLAINES	1 PLAINES	8 PLAINES	4 PLAINES	2 PLAINES	1 PLAINES
XC4013XL/XLA	393823	32M	16M	8M	8M	16M	8M										
XC4020XL/XLA	621890	32M	16M	8M	8M	32M	16M	8M	8M	16M	8M						
XC4028EX/XL/XLA	668184	none	32M	16M	8M	32M	16M	8M	8M	16M	8M						
XC4038EX/XL/XLA	832528	none	32M	16M	8M	32M	16M	8M	8M	16M	8M						
XC4044XL/XLA	1014928	none	32M	16M	8M	32M	16M	8M	8M	16M	8M						
XC4052XL/XLA	1215368	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M	16M	8M	8M	8M
XC4062XL/XLA	1433854	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M	16M	8M	8M	8M
XC4085XL/XLA	1924892	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M	16M	8M	8M	8M
XC40110XV	2888136	none	none	none	32M	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M
XC40150XV	3373448	none	none	none	32M	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M
XC40200XV	4551056	none	none	none	none	none	none	32M	none	none	32M	16M	none	32M	16M	8M	8M
XC40250XV	6433888	none	none	none	none	none	none	32M	none	none	32M	16M	none	32M	16M	8M	8M
XC3050/XL	54644	8M															
XC310/XL	95752	8M															
XC320/XL	179160	16M	8M														
XC330/XL	249168	16M	8M														
XC340/XL	330688	32M	16M	8M	8M	16M	8M										
XC3V50	658232	none	32M	16M	8M	32M	16M	8M	8M	16M	8M						
XC3V100	781248	none	32M	16M	8M	32M	16M	8M	8M	16M	8M						
XC3V150	1041128	none	32M	16M	8M	32M	16M	8M	8M	32M	16M	8M	8M	16M	8M	8M	8M
XC3V200	1335872	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M	16M	8M	8M	8M
XC3V300	1751940	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M	16M	8M	8M	8M
XC3V400	2546080	none	none	none	32M	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M
XC3V800	3608000	none	none	none	32M	none	none	32M	16M	none	32M	16M	8M	32M	16M	8M	8M
XC3V800	4715648	none	none	none	none	none	none	32M	none	none	32M	16M	none	32M	16M	8M	8M
XC3V1000	6127776	none	none	none	none	none	none	32M	none	none	32M	16M	none	32M	16M	8M	8M

Table 1 - Configurator storage capability.

functions to be implemented for the design utilizing the same hardware.

For example, one plane could have a built-in self-test function, while the next plane might have a data process function, and the third plane being a data compression function. Having multiple planes simplifies the design since all of the functions do not need to be accommodated in a single FPGA design and a smaller and faster FPGA size is realized. The Configurator has three dedicated input pins to allow for the configuration plane selection, the planes are selected by setting the RECONFIG[2:0] inputs to the desired plane followed by resetting the device.

### Configurator Integration Options

Adding the Configurator to your designs is easy, and even existing designs can use a Configurator if the design has an Xchecker cable connection. The Configurator typically replaces both serial PROMs and the Xchecker cable connections on a board for up to eight FPGAs. The sample

schematic in Figure 3 shows a Configurator connected to Virtex, XC4000, and XC3000 FPGAs.

You can buy a self-contained module to install on each board or the Configurator can be integrated into your board design by purchasing just the pre-programmed Configurator micro-controller. The Configurator Starter Kit is \$459, which includes a Configurator Module, a serial interface cable, sample schematics and the Configurator Windows GUI. Individual 32-pin DIP modules are available in 8-, 16- and 32-M bit models and pre-programmed micro-controllers are available for higher volume applications.

### Conclusion

The Configurator makes it very easy to program Xilinx FPGAs and it supports the Xilinx Internet Reconfigurable Logic capability allowing you to remotely reconfigure Xilinx FPGAs, over the Internet, anywhere in the world. ❏

For further information, visit the Configurator, Inc. website at [www.fpgaConfigurator.com](http://www.fpgaConfigurator.com).